

REMARKS/ARGUMENTS

Favorable consideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-13 are presently pending in this application, Claims 5-13 having been withdrawn from further consideration by the Examiner, and Claim 1 having been amended by the present amendment.

In the outstanding Office Action, the specification was objected under 35 U.S.C. §112, first paragraph, as failing to provide an adequate description; Claims 1-4 were rejected under 35 U.S.C. §112, first paragraph, as containing subject matter not enabling to one skilled in the relevant art; Claims 1-4 were rejected under 35 U.S.C. §112, second paragraph, as being incomplete for omitting essential elements; Claims 1-4 were rejected under 35 U.S.C. §112, second paragraph, for being indefinite; Claims 1-3 were rejected under 35 U.S.C. §103(a) as being unpatentable over either one of Nagase et al. (U.S. Patent 4,894,202, hereinafter "Nagase et al. '202") or Nishino et al. (U.S. Patent 4,927,598) in view of Nagase et al. (U.S. Patent 5,398,269, hereinafter "Nagase et al. '269") and Carter (U.S. Patent 4,526,626); and Claim 4 was rejected under 35 U.S.C. §103(a) as being unpatentable over either one of Nagase et al. '202-Nagase et al. '269 – Carter combination or Nishino et al.-Nagase et al. '269 – Carter combination, and further in view of either one of Honda et al. (U.S. Patent 4,828,790) or Midorikawa et al. (U.S. Patent 5,995,576).

With regard to the rejections of the specification and claims under 35 U.S.C. §112, Claim 1 has been amended herein, and this claim amendment is believed to find support on page 15, lines 12-13 of the specification. Thus, Claims 1-4 are believed to be in compliance with the requirements of the statute, and the rejections under 35 U.S.C. §112 are believed to be overcome. If, however, the Examiner disagrees, the Examiner is invited to telephone the

undersigned who will be happy to work in a joint effort to derive mutually satisfactory claim language.

Briefly, Claim 1 of the present invention is directed to a method for controlling water quality in a nuclear reactor and the method includes applying an atmospheric oxidation treatment to nickel base alloy material which is used in a feed water heater and a fuel assembly of the nuclear reactor, so that a nickel concentration in the reactor water is maintained so as to be less than 0.2 ppb, making an amount of iron, which is carried into the nuclear reactor and corrosively eluted from structural material within the nuclear reactor into reactor water, at least twice as much as an amount of nickel, which is carried into the nuclear reactor, and an amount of nickel, which is generated in the nuclear reactor, and limiting an upper limit of concentration value of iron in system water supplied into the nuclear reactor to up to 0.10 ppb, the iron being removed by an iron removing device for removing iron from system water supplied into the nuclear reactor.

Nagase et al. '202 disclose a Ni/Fe ratio controlling technique for reducing concentration of radio active substances to be adhered to outside of a reactor core, and the Nagase et al. '202 technique includes the step of *injecting iron to the supply water so as to control Fe/Ni ratio in the supply water and the corrosion product adhered to fuel rod* to be 2 or higher, so that the radiation of the radioactivity of Co-60, Co-58 is suppressed, and the step of reducing the concentration of the radioactivity of Co-60, Co-58 in the reactor water, so that the concentration of the radioactivity to be adhered to the outside of the reactor core.

However, it is respectfully submitted that Nagase et al. '202 do not teach "making an amount of iron, which is carried into the nuclear reactor and corrosively eluted from structural material within the nuclear reactor into reactor water, at least twice as much as an amount of nickel, which is carried into the nuclear reactor, and an amount of nickel, which is generated in the nuclear reactor, and limiting an upper limit of concentration value of iron in

system water supplied into the nuclear reactor to up to 0.10 ppb, said iron being removed by an iron removing device for removing iron from system water supplied into the nuclear reactor” as recited in Claim 1. That is, on the contrary to the Nagase et al. ‘202 technique, according to the method for controlling water quality in a nuclear reactor as recited in Claim 1, *the total amount of iron and nickel (including all of the corrosion products existing on the surface of the materials)* which is carried into the nuclear reactor from the feed water and corrosively eluted from structural material within the nuclear reactor into reactor water, is set so as to provide the Fe/Ni ratio of 2 or more, *and the amount of iron which is carried into the nuclear reactor from the feed water is reduced* under the above condition of the Fe/Ni ratio.

In a BWR, iron generated due to corrosion of stainless steel constituting main structural material of the reactor core is not eluted into the reactor water but forms a corrosion film on the surface of the structural material. If the amount of iron is insufficient and the Ni concentration in the reactor water becomes high, NiFe_2O_4 is formed. Therefore, the method recited in Claim 1 is essentially different from the method of Nagase et al. ‘202 in which the concentration of the radioactivity such as Co-60, Co-58 in the reactor water is reduced by controlling the Fe/Ni ratio in the system water and the reactor water, or by controlling the Fe/Ni ratio of the corrosion products adhered to the surfaces of the fuel rods. Also, the method recited in Claim 1 is different from the Nagase et al. ‘202 method in a technical point that the process is combined with a method of suppressing the Ni amount eluted from the fuel springs and the feed water heater. Therefore, the method recited in Claim 1 provides a different technical effect such that the control condition of the Fe/Ni ratio can be established even if the concentration of iron in feed water is zero, and the amount of the radioactivity generated on the surface of the fuel can be reduced to be zero. Based on the foregoing discussions, Applicants respectfully submit that the subject matter recited in Claim 1 is believed to be distinguishable from Nagase et al. ‘202.

Nishino et al. disclose *a method of promoting nickel and/or cobalt to be converted into ferrite at a primary cooling water recirculation path in the presence of beryllium.* but do not teach “making an amount of iron, which is carried into the nuclear reactor and corrosively eluted from structural material within the nuclear reactor into reactor water, at least twice as much as an amount of nickel, which is carried into the nuclear reactor, and an amount of nickel, which is generated in the nuclear reactor, and limiting an upper limit of concentration value of iron in system water supplied into the nuclear reactor to up to 0.10 ppb, said iron being removed by an iron removing device for removing iron from system water supplied into the nuclear reactor” as recited in Claim 1.

Specifically, *in the method of Nishino et al., the conversion into ferrite of iron adhered to the surface of the fuel can be also promoted.* In this connection, Nishino et al. judged an advantage of the conversion rate of the metal into ferrite by an experimental results obtained from a laboratory test performed in an extremely short experimental period of about 3 hours which is greatly shorter than an actual operation time of 10,000 hours of a nuclear power plant. In contrast, according to the method for controlling water quality in a nuclear reactor as recited in Claim 1, *the total amount of iron and nickel which is carried into the nuclear reactor from the feed water and corrosively eluted from structural material within the nuclear reactor into reactor water, is set so as to provide the Fe/Ni ratio of 2 or more,* and the amount of iron which is carried into the nuclear reactor from the feed water is reduced under the above condition of the Fe/Ni ratio.

In a BWR, iron generated due to corrosion of stainless steel constituting main structural material of the reactor core is not eluted into the reactor water but forms a corrosion film on the surface of the structural material. Based on a *finding obtained from the actual operation results of the BWR, if the amount of iron is insufficient and the Ni concentration in the reactor water becomes high, NiFe_2O_4 is promptly formed even if beryllium does not exist.*

Therefore, the method recited in Claim 1 is essentially different from the method of Nishino et al. in which the concentration of the radioactivity such as Co-60, Co-58 in the reactor water is reduced by controlling the Fe/Ni ratio in the system water and the reactor water, or by controlling the Fe/Ni ratio of the corrosion products adhered to the surfaces of the fuel rods. The method recited in Claim 1 is also technically different from Nishino et al. in that the process is combined with a method of suppressing the Ni amount eluted from the fuel springs and the feed water heater. The method recited in Claim 1 provides a different technical effect such that the control condition of the Fe/Ni ratio can be established even if the concentration of iron in feed water is zero, and the amount of the radioactivity generated on the surface of the fuel can be reduced to be zero. Thus, the subject matter recited in Claim 1 is believed to be distinguishable from Nishino et al.

Nagase et al. '269 disclose a water quality control method in which the iron concentration in the feed water is maintained below 0.05 ppb, so that an amount of Co to be adhered to the surface of the fuel is suppressed as low as possible. However, Nagase et al. '269 is silent about the control of Fe/Ni ratio, and do not teach "making an amount of iron, which is carried into the nuclear reactor and corrosively eluted from structural material within the nuclear reactor into reactor water, at least twice as much as an amount of nickel, which is carried into the nuclear reactor, and an amount of nickel, which is generated in the nuclear reactor, and limiting an upper limit of concentration value of iron in system water supplied into the nuclear reactor to up to 0.10 ppb, said iron being removed by an iron removing device for removing iron from system water supplied into the nuclear reactor" as recited in Claim 1.

In fact, several operation reports on the nuclear power plants, in which the iron concentration in the feed water is limited to below 0.05 ppb, have been already submitted in Japan, but in the above nuclear power plants, Fe/Ni controlled state is quite different from

that Nagase et al. '202. In particular, the iron is in an insufficient state, and the existence of NiO is confirmed, so that Co-60 concentration in the reactor water is high. Therefore, Nagase et al. '269 as well as Nagase et al. '202 cannot obtain the effect of lowering the amount of the radioactivity. Therefore, the method recited in Claim 1 is essentially different from the method of Nagase et al. '269 in which the concentration of the radioactivity such as Co-60, Co-58 in the reactor water is reduced by simply controlling the Fe concentration in the feed water, and in a technical point that the process is combined with a method of suppressing the Ni amount eluted from the fuel springs and the feed water heater. As a result, the method recited in Claim 1 provides a different technical effect such that the control condition of the Fe/Ni ratio can be established even if the concentration of iron in feed water is zero, and the amount of the radioactivity generated on the surface of the fuel can be reduced to be zero. The subject matter recited in Claim 1 is therefore believed to be distinguishable from Nagase et al. '269.

Carter discloses *an anti-corrosion treatment process using EDTA agent*, and the film structure of Carter exhibits that the process of Carter *is effective for a water quality condition of PWR*. Carter, on the other hand, is not believed to teach "making an amount of iron, which is carried into the nuclear reactor and corrosively eluted from structural material within the nuclear reactor into reactor water, at least twice as much as an amount of nickel, which is carried into the nuclear reactor, and an amount of nickel, which is generated in the nuclear reactor, and limiting an upper limit of concentration value of iron in system water supplied into the nuclear reactor to up to 0.10 ppb, said iron being removed by an iron removing device for removing iron from system water supplied into the nuclear reactor" as recited in Claim 1. Also, according to the method recited in Claim 1, since an atmospheric oxidation treatment is applied to the nickel base alloy material, the elution of the material can be effectively suppressed even if the material is immersed in the reactor water of BWR. Since a

great part of the Ni-elution is caused at the fuel spring and the feed water heater, it is sufficient to apply the atmospheric oxidation treatment to only the material constituting the fuel spring and the feed water heater. In general, a film structure exhibiting a corrosion resistance in a reducing atmosphere as in PWR is different from the film structure exhibiting a corrosion resistance in an oxidizing atmosphere as in BWR. The excellence of process of this invention in corrosion resistance has been confirmed under the condition of BWR of which condition is more severe for the materials, thus being a more effective advantage. Further, the atmospheric oxidation treatment recited in Claim 1 is a method of applying a heat treatment such as aging treatment, annealing treatment or the like to the fuel spring and the feed water heater under an atmospheric condition. Therefore, the process as recited in Claim 1 is different from the conventional process in a technical point that the process recited in Claim 1 needs not use chemicals as in Carter or precious metals as in Niedrach and Hettiarachchi. Thus, the subject matter recited in Claim 1 is distinguishable from Carter.

Honda et al. disclose a method *wherein an oxidation treatment is applied to the material in a high temperature water containing 3 ppb-1000 ppm of polyvalent metal including Zn, so that an adhesion of radioactive substance is suppressed before the operation of the nuclear power plant*, but are not believed to teach "making an amount of iron, which is carried into the nuclear reactor and corrosively eluted from structural material within the nuclear reactor into reactor water, at least twice as much as an amount of nickel, which is carried into the nuclear reactor, and an amount of nickel, which is generated in the nuclear reactor, and limiting an upper limit of concentration value of iron in system water supplied into the nuclear reactor to up to 0.10 ppb, said iron being removed by an iron removing device for removing iron from system water supplied into the nuclear reactor" as recited in Claim 1. Furthermore, the method recited in Claim 4 provides a method for controlling water

quality in a nuclear reactor, in which *a natural zinc is injected into the reactor water during the operation of the nuclear power plant so that the zinc concentration is set to up to 5 ppb.*

Therefore, the timing of injecting zinc and the timing of exhibiting the aimed effect in the present process and Honda et al. are different to each other. Hence, the subject matters recited in Claims 1 and 4 are distinguishable from Honda et al.

Midorikawa et al. disclose a method wherein *5-50 ppb of polyvalent metal including upper most 1 ppb of Zn is added to the cooling water so that the adhesion of the radioactive substance is suppressed.* However, Midorikawa et al. are believed teach neither “making an amount of iron, which is carried into the nuclear reactor and corrosively eluted from structural material within the nuclear reactor into reactor water, at least twice as much as an amount of nickel, which is carried into the nuclear reactor, and an amount of nickel, which is generated in the nuclear reactor, and limiting an upper limit of concentration value of iron in system water supplied into the nuclear reactor to up to 0.10 ppb, said iron being removed by an iron removing device for removing iron from system water supplied into the nuclear reactor” as recited in Claim 1, nor “introducing natural zinc into the reactor water to limit a zinc ion concentration value to up to 5 ppb” as recited in Claim 4. Instead, in the process of Midorikawa et al., an upper limit of Zn is limited to 1 ppb for preventing the generation of Zn-65. Further, in the method recited in Claim 1, since the upper limit of concentration value of iron in system water (feed water) is limited to up to 0.10 ppb which is greatly lower than that of the conventional standard BWR, an inventory of Zn-65 generated on the surface of the fuel can be reduced to be 1/10 or smaller, so that there is no obstruction to reduce the generation of the radioactive substance. As such, the subject matters recited in Claims 1 and 4 are believed to be distinguishable from Midorikawa et al.

Because none of the references discussed above discloses the subject matter as recited in Claim 1, even the combined teachings of these cited references are not believed to render the method recited in Claim 1 obvious.

Additionally, it is respectfully submitted that Niedrach and Hettiarachchi disclose a *method of preventing corrosion of the material constituting a BWR by utilizing a noble metal (platinum group of metals)*, but neither one of these references teach “making an amount of iron, which is carried into the nuclear reactor and corrosively eluted from structural material within the nuclear reactor into reactor water, at least twice as much as an amount of nickel, which is carried into the nuclear reactor, and an amount of nickel, which is generated in the nuclear reactor, and limiting an upper limit of concentration value of iron in system water supplied into the nuclear reactor to up to 0.10 ppb, said iron being removed by an iron removing device for removing iron from system water supplied into the nuclear reactor” as recited in Claim 1.

As mentioned in the previous discussion for Carter et al., the method recited in Claim 1 does not utilize valuable and very costly metal source or chemicals, thus being a highly economical process. Also, the atmospheric oxidation treatment used in the method recited in Claim 1 is *a method of applying a heat treatment such as aging treatment, annealing treatment or the like to the fuel element such as fuel spring and the feed water heater under an atmospheric condition. Therefore, the method recited in Claim 1 is different from the process of Niedrach and Hettiarachchi in a technical point that the process of this invention needs not to use chemicals as in Carter or precious metals as in Niedrach and Hettiarachchi,* and the effect of the atmospheric oxidation treatment has been confirmed to be greatly advantageous by the experimental data. The subject matter recited in Claim 1 is thus distinguishable from both Niedrach and Hettiarachchi.

Furthermore, like Nagase et al. '202, Lin et al. disclose a method of controlling Fe/Ni ratio by injecting iron (Fe) into the cooling water, and do not teach "making an amount of iron, which is carried into the nuclear reactor and corrosively eluted from structural material within the nuclear reactor into reactor water, at least twice as much as an amount of nickel, which is carried into the nuclear reactor, and an amount of nickel, which is generated in the nuclear reactor, and limiting an upper limit of concentration value of iron in system water supplied into the nuclear reactor to up to 0.10 ppb, said iron being removed by an iron removing device for removing iron from system water supplied into the nuclear reactor" as recited in Claim 1. Specifically, Fe/Ni ratio in the feed water or Fe/Ni ratio in the generated corrosion product adhered to surfaces of the fuel rod is controlled to be 2 or more, whereas the process as recited in Claim 1 is directed to a technique wherein iron is not injected at all. From this point of view, the method recited in Claim 1 is quite different from that of Lin et al., and thus is distinguishable therefrom.

In response to Item 2 of the Office Action, Applicants wish to point out as follows. As a method for reducing the amount of the radioactive substances and for controlling the Fe/Ni ratio, reactor water and material other than the fuel are taken into consideration. On the surface of main material other than the fuel, a film mainly composed of iron is formed. The method of controlling the Fe/Ni ratio by injecting iron as disclosed in Nagase et al. '202 or Lin et al. can lower the amount of Co-58 ion and Co-60 ion. However, the above controlling method increases the amount of crud-type radioactive substance. In order to reduce the crud-type radioactive substance, it is important to lower the iron concentration in the feed water. Therefore, in order to reduce the amount of radioactive substance in an entire nuclear power plant, a technique to reduce both ion-type radioactive substance and crud-type radioactive substance is necessary. As the method of reducing the ion-type radioactive substance such as Co-58, Co-60 or the like, it is effective to reduce the radioactive substance

eluted from the fuel spring which has a large corrosion rate when it receives the radiation.

Further, a controlled state where Fe molar concentration is at least twice as much as the Ni molar concentration should be maintained so as not to generate NiO on the surface of the fuel. In addition, it is important to suppress the corrosion of the fuel spring.

On the other hand, in order to reduce the crud-type radioactive substance, it is important to reduce the concentration of iron in the feed water. Further, the lowering of the amount of Ni generation is necessary to satisfy the requirement for controlling Fe/Ni ratio and for lowering the iron concentration in the feed water. As the material in the reactor, the fuel spring is important because the fuel spring is composed of material of which iron molar ratio is twice as less as Ni molar ratio. The feed water heater is also important as a main source of generating the radioactive substance which is carried into the reactor vessel, because Fe-Ni compound generated due to the corrosion at the heater is liable to be carried into the reactor vessel and liable to elute Ni or the like into the cooling water.

Therefore, a limiting condition of the iron concentration in the feed water supplied from outside the reactor vessel depends on a molar balance between the Fe and Ni amounts in the reactor vessel. Namely, the limiting value of the iron concentration in the feed water depends on a suppression degree of the corrosion of the fuel element such as fuel spring or the like and the feed water heater, and also depends on a selection of the material because the corrosion rate is small when the material has a large amount of Fe and a small amount of Ni.

As described above, each of the techniques of Fe/Ni ratio control, the limiting the iron concentration in the feed water, method of suppressing the corrosion, and the zinc injecting method or the like and effect of the respective techniques is known art.

However, the meaning of controlling Fe/Ni ratio of the present invention is quite different from the conventional concepts. In addition, when the Ni generation amount was severely suppressed by applying the atmospheric oxidation treatment to the fuel element and

the feed water heater, the following finding was obtained. Namely, *the condition that the total amount of iron and nickel which is carried into the nuclear reactor from the feed water and corrosively eluted from structural material within the nuclear reactor into reactor water, is satisfied so as to provide the Fe/Ni ratio of 2 or more. In this case, since $ZnFe_2O_4$ is not formed on, the surface of the fuel, there is no generation of Zn-65 in the ferrite. Accordingly, there can be provided a remarkable effect such that it becomes possible to use natural zinc for the purpose of reducing the radioactive substance.*

In response to Items 3 to 6 of the Office Action, Applicants wish to point out as follows. As the Office Action notes, in the reactor vessel, there exist variable equipments such as reactor pressure vessel, piping, valves, welded metals or the like which contact the cooling water. These equipments are basically composed of stainless steel, Ni-base alloy such as Inconel or the like, Co-base alloy such as Stellite or the like and carbon steel including low alloy steel. The water-contact area, metal composition, corrosion rate (including variation with time), corrosion characteristics such as corrosive elution, corrosive film formation or the like of these materials have been investigated. Further, the amounts of corrosion products of Fe and Ni (including a small amount of Co) generated from the above materials have been also evaluated.

The material other than the fuel element such as fuel spring or the like is not renewed at the time of fuel exchange. A main material for constituting BWR is stainless steel, and a weight ratio of Fe: Ni is equal to 69:14. Therefore, a scale relation between the generation amount of Fe (Σa_i) and the generation amount of Ni (Σb_i) basically satisfy the following equation.

$$(\Sigma a_i) > (\Sigma b_i)$$

Also in terms of molar concentration, the molar concentration of Fe is at least twice larger than the molar concentration of Ni. Accordingly, if there is no generation of Ni from the fuel

element and the feed water, it can be said that the plant is in a state where Fe/Ni ratio is suitably controlled and maintained.

On the other hand, in the fuel element and the feed water under the operating conditions of the present BWR, the total amount of Fe generated in the reactor vessel and carried thereto is smaller than twice the amount of Ni. However, when the material to become a main generation source of Ni is applied with the atmospheric oxidation treatment thereby to reduce the generation amount of Ni, it becomes possible to set the molar concentration of Fe to at least twice the molar concentration of Ni in entire nuclear power plant.

In this regard, in a case where Inconel Ni base alloy (Alloy X-750) is used as a material for constituting the fuel spring of the fuel element, the weight ratio of Fe: Ni is equal to 6:72. Therefore, a scale relation between the generation amount of Fe (Σa_i) and the generation amount of Ni (Σb_i) basically satisfy the following equation.

$$(\Sigma a_i) < (\Sigma b_i)$$

Also in terms of molar concentration, the molar concentration of Fe is smaller than at least twice the molar concentration of Ni.

Accordingly, since the main material for constituting the fuel element is Inconel, the generation amount of Fe at this fuel element portion is always smaller than twice the generation amount of Ni even if the generation amount of Ni is reduced by applying the atmospheric oxidation treatment or the like to the fuel element. Further, since the material constituting the fuel element is exchanged at the time of fuel exchange, a certain amount of Ni (in terms of cycle average in an equilibrium core) becomes excessive. As one requirement for satisfying the controlled Fe/Ni ratio, it is necessary to introduce some amount of Fe counterbalancing the above excessive amount of Ni through the feed water. This amount value of Fe introduced from the feed water is the lower limit of the iron concentration in the

feed water, which determines the control of Fe/Ni ratio. In this regard, when the material constituting the fuel spring is changed to a material, for example, a stainless steel containing iron at a molar amount twice larger than that of Ni, the lower limit of concentration of Fe in the feed water for determining the Fe/Ni ratio control can be reduced to be zero. On the other hand, the Ni amount carried from the feed water heater is required to be reduced at an amount counterbalancing the excessive amount of Fe due to the material used in the reactor vessel.

In view of the above explanations, in order to reduce the amount of radioactive substance, it is effective to use a corrosion resistant material which is prepared by applying the atmospheric oxidation treatment to the currently used material, or to use a material containing a small amount of Ni.

In response to Item 7 of the Office Action, Applicants wish to point out as follows. The method recited in Claim 1 includes a technique capable of greatly reducing the generation amount of Ni in comparison with the amount of Fe even if the Fe amount in the feed water is reduced thereby to achieve the Fe/Ni control, and ultimately reduces the amount of radioactive substance as low as possible to a level of almost zero. Further, the method recited in Claim 1 converts the corrosion product generated at fuel element and outside the reactor vessel of BWR into nickel-ferrite without using beryllium.

Furthermore, in a currently used BWR plant in which the Fe concentration in the feed water is reduced, the BWR plant is not in a state as explained by Nagase et al. '269. Namely, nickel concentration is excessively high, Fe/Ni ratio of oxide is less than 2, and the concentrations of Co-58 and Co-60 are increased. That is, the controlled Fe/Ni ratio as specified in the method recited in Claim 1 is not established.

Accordingly, the reduction of Ni amount generated from the fuel element such as fuel spring and the feed water heater is an essential for effectively reducing the radioactive substance to be generated from the entire plant.

The limited value of the Fe concentration in the feed water is not lead out from Nagase et al. '269 as an estimation or prediction, but strictly specified on the basis of necessity of the reduction of Ni amount generated from the fuel element such as fuel spring and the feed water heater. At any rate, Nagase et al. '269 do not explain the actual plant results at all. In addition, logic of controlling Fe/Ni ratio is also quite different from that of the process of Nagase et al. '269.

As a corrosion prevention method for a material, several methods including Carter have been proposed. However, a concept of specifying an object, i.e., the fuel element and the feed water heater, to which a corrosion prevention treatment should be applied for the purpose of controlling Fe/Ni ratio, is not described at all in any of the prior art references including Carter. The methods recited in Claims 1-4 are performed without using any chemicals, and there is no need to install any additional facility. In particular, since the process recited in Claim 1 adopts the atmospheric oxidation treatment which can be easily performed at low cost in comparison with the conventional heat treatment required to strictly control an environment to be vacuum, inert gas atmosphere, or reducing gas atmosphere or the like. The effect of the atmospheric oxidation treatment has been actually evidenced by the actual BWR plant.

Finally, with regard to Section 8 of the Office Action, Applicants wish to point out as follows. There are various restrictions on kind of zinc to be injected, concentration range of zinc, and timing of using zinc. However, according to the method recited in Claim 4, since the condition of extremely lowering the amount of Fe in the feed water has been actually realized, there is no need to use highly purified zinc. Instead, inexpensive natural zinc can be adopted, thus being economical.

For the foregoing reasons, Claim 1 is believed to be allowable. Furthermore, since Claims 2-4 depend directly from Claim 1, substantially the same arguments set forth above

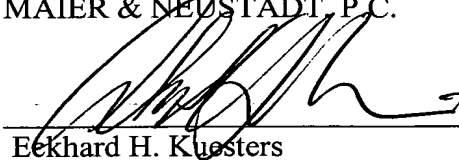
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also apply to these dependent claims. Hence, Claims 2-4 are believed to be allowable as well.

In view of the amendments and discussions presented above, Applicants respectfully submit that the present application is in condition for allowance, and an early action favorable to that effect is earnestly solicited.

Respectfully submitted,

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